Generative AI in healthcare: an implementation science informed translational path on application, integration and governance

Abstract

Artificial intelligence (AI), particularly generative AI, has emerged as a transformative tool in healthcare, with the potential to revolutionize clinical decision-making and improve health outcomes. Generative AI, capable of generating new data such as text and images, holds promise in enhancing patient care, revolutionizing disease diagnosis and expanding treatment options. However, the utility and impact of generative AI in healthcare remain poorly understood, with concerns around ethical and medico-legal implications, integration into healthcare service delivery and workforce utilisation. Also, there is not a clear pathway to implement and integrate generative AI in healthcare delivery. This article aims to provide a comprehensive overview of the use of generative AI in healthcare, focusing on the utility of the technology in healthcare and its translational application highlighting the need for careful planning, execution and management of expectations in adopting generative AI in clinical medicine. Key considerations include factors such as data privacy, security and the irreplaceable role of clinicians' expertise. Frameworks like the technology acceptance model (TAM) and the Non-Adoption, Abandonment, Scale-up, Spread and Sustainability (NASSS) model are considered to promote responsible integration. These frameworks allow anticipating and proactively addressing barriers to adoption, facilitating stakeholder participation and responsibly transitioning care systems to harness generative AI's potential. Generative AI has the potential to transform healthcare through automated systems, enhanced clinical decision-making and democratization of expertise with diagnostic support tools providing timely, personalized suggestions. Generative AI applications across billing, diagnosis, treatment and research can also make healthcare delivery more efficient, equitable and effective. However, integration of generative AI necessitates meticulous change management and risk mitigation strategies. Technological capabilities alone cannot shift complex care ecosystems overnight; rather, structured adoption programs grounded in implementation science are imperative. It is strongly argued in this article that generative AI can usher in tremendous healthcare progress, if introduced responsibly. Strategic adoption based on implementation science, incremental deployment and balanced messaging around opportunities versus limitations helps promote safe, ethical generative AI integration. Extensive real-world piloting and iteration aligned to clinical priorities should drive development. With conscientious governance centred on human wellbeing over technological novelty, generative AI can enhance accessibility, affordability and quality of care. As these models continue advancing rapidly, ongoing reassessment and transparent communication around their strengths and weaknesses remain vital to restoring trust, realizing positive potential and, most importantly, improving patient outcomes.